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Original Article

Teacher- and Student-Centered Learning in a Hierarchical, Collectivist Context

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Abstract

Background: The growing trend of student-centered learning (SCL) in Asia demands specific attention to existing cultural characteristics and their effects on learning.

Objectives: This study aimed to assess and compare the effectiveness of teacher-centered learning (TCL) and various SCL approaches in enhancing Indonesian undergraduate medical students' knowledge in contexts characterized by hierarchical and collectivist values. Additionally, we aimed to measure students' satisfaction with learning through the respective learning methods and to explore the learning experiences underlying their satisfaction (or dissatisfaction) with them.

Methods: A total of 164 2nd year undergraduate medical students from one private school participated in this experimental, mixed-method study using a concurrent triangulation design. Participants were divided into four groups: TCL, flipped classroom (FC), question-based discussion (QBD), and peer-assisted learning (PAL). Effectiveness was measured using a post-test. Students' satisfaction data were gathered quantitatively and qualitatively using a questionnaire. Quantitative data were analyzed using the Kruskal-Wallis test, followed by a post-hoc test. A p-value of ≤0.05 was considered statistically significant. Qualitative data on students' satisfaction were analyzed using an inductive coding approach to thematic analysis.

Results: Post-test scores show no statistically significant difference between the TCL and SCL methods (p=0.334). Students' satisfaction with the TCL method was higher compared to the SCL methods (p≤0.05). Two main themes were identified: positive learning experiences and challenges.

Conclusion: TCL and SCL are comparably effective in increasing undergraduate medical students' knowledge in Indonesia. Although TCL showed higher student satisfaction, a combination of TCL with PAL and FC may be worth considering.

Keywords: Undergraduate Medical Education; Teaching Method; Satisfaction

Background

Traditionally, the didactic lecture was one of the staple methods of teaching in higher education, as it enables the delivery of learning materials to a large group of students at once. However, this teacher-centered learning (TCL) approach limits students' active participation, and its benefits are increasingly questionable (1, 2). Nowadays, student-centered learning (SCL) is attracting attention for its promising potential (3, 4) and alignment with the principles of adult learning (5-7).

Historically, initial research on SCL was conducted in Western countries, with problem-based learning (PBL) among the most studied in medical education (8-11). In the past few decades, learning reforms in higher education have been attempted across many

Asian countries, shifting traditional TCL approaches towards SCL pedagogies. Although the implementation of SCL, such as PBL, rapidly grew across medical schools in Asia, these learning reforms were not without issues (12, 13). In teaching and learning, culture holds a significant influence (14), thus "learning will not necessarily have the same outcomes in a place where institutional conditions and cultural values are different" (13).

Indonesia was one of the Asian countries participating in said learning reform. In terms of learning environment, Hofstede et al.'s theory of cultural dimensions described Indonesia as having two main characteristics: hierarchical and collectivist. Teaching and learning in a hierarchical setting are characterized by the presence of 'power distance' between the teacher and the learner. In contrast, a collectivist setting is characterized by the tendency to achieve and maintain the best interest of the group (14). The effect of these cultural aspects has been reported in a few studies involving clinical clerkship students (15, 16). At the undergraduate medical education level, studies describing students' experiences with SCL mostly used PBL or case-based methods (17-20). This study was primarily intended to add another perspective to the existing body of knowledge on the implementation of SCL methods beyond PBL and case-based methods among undergraduate medical students in Indonesia.

Objectives

This study aimed to measure knowledge and satisfaction, as well as to explore the learning experiences related to the satisfaction of students who underwent different teaching methods, namely TCL and several SCL methods, flipped classroom (FC), question-based discussion (QBD), and peer-assisted learning (PAL), in the topic of medical mycology.

Methods

This is an experimental, mixed-methods study using a concurrent triangulation design, in which quantitative and qualitative data were collected in a single phase. This design allows for a more complete understanding of the experimental study by merging two data sets during interpretation after the respective analyses. The interpretation process is iterative, allowing continuous, complementary corroboration of the study objectives (21). Quantitative data provided an overview of the first study objective, which was to measure and compare the effectiveness of TCL and several SCL methods in increasing undergraduate medical students' knowledge about medical mycology. Qualitative data provided participants' perspectives on their learning experience with these learning methods, allowing further elaboration on what may have affected the quantitative data.

This study was conducted at a private medical school in Indonesia, and the sample size was determined using a total sampling approach. All eligible second-year medical students in the medical mycology module were included in the study. In total, 164 students were recruited and categorized into four groups, allowing the analysis to represent the entire accessible population for the academic year. The topic of medical mycology was selected because the application of various SCL approaches in this topic remains limited. In many institutions, teaching in this area still relies primarily on TCL, with laboratory sessions and case-based learning occasionally incorporated (22). All students provided written consent, and those who did not attend the lecture or did not consent to participate were excluded. The medical school ethical committee approved this study.

Students were first ordered by ascending student identification numbers. Simple randomization was then performed by the faculty administration team using an internet-based random number generator (Calculator.net), producing a randomized sequence used to allocate students into four groups based on the assigned learning method. Group 1 was assigned the TCL method, while groups 2-4 were assigned sequentially to the flipped classroom, QBD, and PAL. Subsequently, PAL participants were further divided into 4 groups consisting of 11 individuals using the same randomization method. In TCL, a lecturer taught the material using a PowerPoint slide in one 100-minute offline session, occasionally incorporating two-way interaction through questions and answers. In the FC method, the lecturer provided learning materials in the form of PowerPoint slides three days before the offline synchronous learning, during which the facilitator held a question-and-answer session. In the QBD method, students were required to answer several case study questions in medical mycology and present their work via a PowerPoint presentation. The PAL method was similar to QBD, except it was conducted in smaller groups and facilitated by peer tutors from a higher academic year (cross-age peer tutoring). A training-of-tutor session was conducted to ensure standard and consistency.

Data, including post-test scores and students' satisfaction, were collected via an online questionnaire comprising 10 short-answer questions. A correct answer scores 10 points, and an incorrect answer scores 0 points. Students' satisfaction was measured using a 5-point Likert scale. The questionnaire was modified from those of Haviz (23) and Keengwe (24), translated into Indonesian, and validated (Supplementary material 1). Item validity was assessed using corrected item-total correlations, with coefficients greater than 0.30 considered acceptable. The questionnaire's reliability was evaluated using Cronbach's alpha. The data were analyzed using SPSS for Windows version 26. Normality was assessed using the Kolmogorov-Smirnov test. Differences between groups were tested using the Kruskal-Wallis test, followed by a Bonferroni post-hoc test when significant differences were found. A p-value of ≤ 0.05 was considered statistically significant. The effect size was calculated as follows: $\eta^2 = (H - k + 1) / (N - k)$ where H is the Kruskal-Wallis statistic, k is the number of groups, and N is the total sample size. The interpretation thresholds were as follows: small effect (0.01-0.06), medium effect (0.06-0.14), and large effect (≥ 0.14).

Students' satisfaction was assessed through their responses to 3 open-ended questions: whether the learning method met their expectations, the challenges encountered during learning, and the positive aspects of the learning method. The qualitative data were analyzed using a data-driven inductive approach to thematic analysis (25). Raters initially excluded brief responses that offered no additional elaboration, such as "-", "none", "yes", "no", or similar remarks. An initial codebook, including codes, definitions, and categories, was developed by one of the authors. To ensure the rigor of the analysis process, interrater meetings were held occasionally with all authors to discuss the codes, categories, and themes developed. Member checking with several participants was conducted to clarify unclear data, ensuring raters did not make interpretations based on their own assumptions when in doubt. The final codebook, finalized after agreement among all raters, was presented in a matrix table to facilitate comparing groups (26).

In qualitative research, the researchers' positionality is an important factor in increasing accountability within a given study (25). SSS, BPR, and VDJJ were assistant professors, CDK was a teaching assistant, and AIG was a fourth-year undergraduate medical student at the medical school at which this study was conducted. DD was an assistant professor at another medical school in Indonesia. Study. SSS was involved in teaching the participants in the TCL intervention group. Several steps throughout this study were designed to mitigate the effects our positionalities might have on this research. Occasional meetings were held with all authors, during which we actively encouraged one another to share our opinions on various aspects of the study and its progress. Member checking with participants also helped prevent the author's interpretation of what might not accurately represent the participant's voice.

Results

Participants, post-test scores, and students' satisfaction: A total of 164 participants were included: 40 students in the TCL group, 42 in the FC group, 38 in the QBD group, and 44 in the PAL group. For the PAL group, students were divided randomly into 4 groups of 11 members each (Table 1).

Table 1. Post-test scores and quantitative data on students' satisfaction

Group	N	Median (min-max)	IQR	Mean (standard deviation)	p-value*
Post-test score					
TCL	40	80 (50-100)	20	80.50 (11.536)	0.344
FC	42	80 (50-100)	20	80.00 (13.793)	
QBD	38	80 (60-90)	10	77.63 (8.833)	
PAL	44	80 (50-100)	18	80.23 (13.552)	
Quantitative data on students' satisfaction					
TCL	40	40.00 (34-50)	6	40.77 (4.486)	0.00
FC	42	37.00 (24-49)	4	37.02 (4.420)	
QBD	38	34.00 (25-43)	7	34.58 (4.512)	
PAL	44	37.50 (30-48)	5	37.82 (3.919)	

*Kruskal-Wallis test. N: Number of students. IQR: Interquartile range. TCL: Teacher-centered learning. FC: Flipped classroom. QBD: Question-based discussion. PAL: Peer-assisted learning.

The post-test scores did not follow a normal distribution (p<0.001). All groups shared the same median value of 80. Although the TCL group had the highest score, the differences between groups were not significant (H=3.401, p=0.334, Table 1). The effect size was very small and negligible ($\eta^2 = 0.0025$).

Corrected item-total correlation analysis showed that all questionnaire items exceeded the validity criterion ($r > 0.30$), except for concern about unclear learning material (question 4, $r = 0.174$), the need for more time to learn (question 6, $r = 0.255$), and perceived independence in learning (question 7, $r = 0.19$). Although their limited variability may have contributed to the lower correlation values, these items were retained since they captured relevant aspects of students' experiences. The questionnaire's internal consistency was good, with a Cronbach's alpha of 0.806.

Student satisfaction scores were not normally distributed ($p<0.001$). The TCL group had the highest median score, while the QBD group had the lowest ($H=31.74$, $p\leq0.05$; Table 1). The effect size indicated a large effect ($\eta^2 = 0.179$). Post-hoc analysis showed that the TCL group's median score was significantly higher than those of the other groups ($p\leq0.05$, Table 2). Among the three SCL groups, the PAL and FC groups had higher median scores than the QBD group. Although the PAL group had a slightly higher median score than the FC group (37.50 and 37.00), the difference was not statistically significant.

Table 2. Post-hoc analysis on quantitative students' satisfaction data (Bonferroni test)

Comparison between groups		p-value
A	B	
TCL	FC	0.003*
TCL	QBD	0.000*
TCL	PAL	0.019*
FC	QBD	0.189
FC	PAL	1.000
QBD	PAL	0.032*

*TCL: teacher-centered learning. FC: flipped classroom. QBD: question-based discussion. PAL: peer-assisted learning.

Initially, 74 responses that lacked additional elaboration were excluded. The remaining responses were categorized into two main themes: positive learning experiences and challenges. Raters developed a codebook consisting of 36 codes: 19 reflecting positive experiences and 17 representing challenges encountered during learning. The codes were grouped into several categories. Four categories were identified for positive learning experiences: delivery of learning method, facilitator's role, perceived outcome or benefit, and other. Challenges were categorized into those encountered in class and those encountered outside of class (before or after class). All raters agreed on the codebook, which was presented as a matrix showing in which group(s) each code was found, facilitating a practical comparison of results across groups (Supplementary material 1-3). Relevant quotes corresponding to the themes are presented in Supplementary material 4.

Each group has its own positive learning experiences and challenges. Regarding positive experiences, most methods showed fairly similar results. However, based on the matrix, the FC group had the highest number of positive learning experiences (18 codes), followed by the TCL group (17 codes). Among the four groups, the QBD group encountered the most challenges.

Small Class Size and Interactivity: Students in both TCL and SCL groups reported that interactivity was a positive learning experience. Although some students found it challenging to recall prior knowledge and felt pressure to think critically during these sessions, they believed these interactions helped them better memorize and recall learned material and develop critical thinking skills. Students also highlighted a strong preference for smaller class sizes. They felt that smaller classes promoted more effective interaction, enabling greater participation and personalized engagement. "Indy" (pseudonym, FC group) described how *"this class would be most effective if done in small groups."* Similarly, "Sharon" (pseudonym, TCL group) believed that "Question-and-answer (interaction) encouraged students to pay attention and think."

Students' Learning Experiences with SCL Methods: Students from all SCL groups reported that these learning methods stimulated their motivation to learn. However, they also emphasized that adequate preparation beforehand was a significant challenge.

The challenge was if before class (we) really did not study and find the material, (we) would feel slightly confused in class because further explanations were only given for things that were not adequately covered during (peer's presentation, so before class (we) really need to read the material on our own. (Anne, pseudonym, QBD group on the challenges encountered during the learning process).

During the preparation phase, students faced several difficulties, including selecting appropriate references ("finding suitable learning source"), independently comprehending pre-class materials ("understanding pre-class material"), and misjudging the depth of study required ("misperception"). These challenges were further compounded by a sense of doubt over their capability to learn independently ("lack of confidence"). Supporting quotes are provided in Supplementary material 4. Regardless, students across all SCL groups reported that preparing beforehand gave them prior

knowledge that enhanced their in-class learning. For example, "Astrid" (pseudonym, QBD group) stated that *"(she) understood better because (she) had read for the presentation and became more prepared in answering questions"*.

Interestingly, students in the PAL group reported several positive experiences not observed in the QBD group, despite similar content delivery by a different facilitator. These positive experiences included ample opportunities to ask questions ("chance to ask"), more personal student-teacher interactions ("more personal"), and less pressure ("creates a safe environment"). In addition, several challenges commonly found in the QBD group, including pressure to be more active ("the demand to be more active"), misperception, difficulties in "understanding certain concepts", and feeling pressured by the "time constraint", were not observed in the PAL group.

Facilitator's Role: Facilitators in both TCL and SCL groups were portrayed as professionals competent in their subjects, serving as reliable learning sources. Students appreciated how facilitators, whether teachers or peer tutors, created optimal learning environments through positive attitudes and personality traits such as kindness, fun, encouragement, patience, and understanding. Both TCL and SCL students valued the chance to ask questions and receive appropriate feedback, including clarifications on confusing concepts.

The source of material became clearer, the doctor (i.e. facilitator) was also very helpful in correcting, supplementing, and explaining important points of this topic, so we did not lack any information or explore this topic too far and out of topic, very helpful. Abby, pseudonym, QBD group, on the positive aspects of the learning method.

Discussion

Both TCL and SCL methods were comparable in improving students' comprehension in medical mycology, as reflected in their post-test scores. This indicates that all methods had a similar impact on students' achievement of the expected learning outcomes. In terms of preference, students in the TCL group reported higher satisfaction than those in the SCL groups. Among the SCL methods, PAL had the highest median satisfaction score, significantly higher than QBD, though not significantly different from FC, suggesting that students tended to gravitate towards more teacher-oriented approaches. They also indicate that, among the SCL approaches examined, PAL and FC were more favorably received compared to QBD. Qualitative analysis of students' satisfaction data allowed further exploration of their learning experiences underlying their satisfaction or dissatisfaction with the learning methods. Although 74 qualitative responses were excluded for lacking analyzable content, this exclusion did not affect the quantitative satisfaction results and is expected to have only a minimal impact on the qualitative interpretation.

First, across all groups, students appreciated interactivity and the opportunity to learn in smaller classes. As context, regular classes at this university typically include around 200 students, whereas this study involved a maximum of 44 students per group. Syah et al. noted that students in a collectivist setting prefer smaller groups to maintain collective harmony (27). In our study, students expressed a similar preference, noting that a smaller class size helped them engage in more personal interactions, maintain better focus, feel more confident speaking up during discussions, and experience a more conducive learning environment.

Students in both TCL and SCL groups described interaction as "challengingly beneficial". During question-and-answer and discussion sessions, some students lacked confidence, struggled to recall prior knowledge, and felt pressured to think more critically. Such pressure may be related to the characteristic of a collectivist setting, where losing face is avoided (27). Despite these challenges, students remarked that such interactions helped them memorize and recall material and enhanced their critical thinking. Aside from active participation, effective learning requires engaging students with the appropriate level of difficulty, known as desirable difficulty, which promotes long-term retention and retrieval (5). Question-and-answer strategies are one approach to introducing desirable difficulty (28).

One of the most prominent challenges for SCL groups was preparing independently before synchronous sessions, a finding consistent with previous studies (29-31). This challenge may be more pronounced in hierarchical and collectivist contexts, where students are strongly accustomed to TCL. Studies have reported that students often feel confused or uncertain about directing their own learning (32, 33). Our findings suggest that to improve the learning experience in SCL, teachers should provide clear, specific instructions, references, and learning objectives. During synchronous sessions, the role of the teacher or peer tutor remains important for equalizing understanding and correcting misconceptions that may arise during self-directed learning.

Another interesting finding is that students in both TCL and SCL groups highlighted the facilitator's attitude as a positive aspect of their learning experience. In a hierarchical setting, teachers often play a dominant role (27), which may inhibit active participation. Based on the student reflections in this study, we propose that teachers or facilitators create a 'safe learning environment' to reduce power distance and encourage more active student participation.

Interestingly, students responded more positively to PAL compared to QBD, despite both using the same question set. As previously discussed, the smaller class size created a more personal and safe learning environment, which, along with the presence of peer tutors, allowed students to ask questions and engage in discussion. This SCL approach produced a learning experience comparable to TCL while maintaining SCL's benefits. Keerthirathne noted that having a peer as a facilitator can help reduce the hierarchical gap (34), an observation also made in this study. However, this advantage should not be taken at face value. Learning from peers might pose certain difficulties, such as doubt about a peer's explanation or partial comprehension of the topic. This is understandable within a hierarchical learning culture, where teachers are perceived as reliable and competent figures expected to guide students (27).

Overall, each method exhibits its own strengths and weaknesses. Nevertheless, within a hierarchical, collectivist culture, our findings still suggest that TCL remains the preferred approach. Given the positive experiences and challenges of each method, a combination of them may be beneficial. Among all methods examined, QBD posed the greatest challenges, generated the lowest positive experiences and satisfaction scores, and yielded the lowest post-test score. However, this was not statistically significant.

Several aspects could be improved in future research. Learning and culture are both very complex matters. Incorporating questions specifically targeted at cultural dimensions may yield deeper insights. Alternative approaches, such as focus group discussions or ethnographic studies, may yield novel insights. Further studies are also needed to explore the potential applications of SCL methods in hierarchical and collectivist settings across different medical topics, levels of education (clinical rotations or residency), and SCL methods. Finally, future studies should consider the potential instructor-related response bias arising from participants' interactions with a familiar instructor and adopt an appropriate approach to mitigate its effects.

Conclusion

In the context of a collectivist, hierarchical culture in this study, both TCL and SCL are comparably effective in increasing undergraduate medical students' knowledge of medical mycology. Although TCL demonstrated an advantage in student satisfaction, a combination of TCL with SCL methods, such as PAL and FC, may be worth considering, as they offer complementary strengths and benefits not found in the TCL approach. The use of QBD is not recommended unless accompanied by certain modifications. Whether these findings apply to broader Asian countries or different medical topics remains to be explored in future research.

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Ethical approval: The study was approved by Atma Jaya Catholic University of Indonesia Ethical Committee (16/10/KEP-FKIKUAJ/2023).

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Authors Contributions: SSS conceptualized the study, analyzed the data, and contributed to writing, reviewing, and validating the final manuscript. CDK contributed to data analysis and also the writing process, reviewing and validating the final manuscript. VDJJ contributed to the conceptualization of this study and reviewed and validated the final manuscript. AIG contributed to the conceptualization, data collection, and analysis, as well as to writing, reviewing, and validating the final manuscript. BPR contributed to the writing process, editing, reviewing, and validating the final manuscript. DD contributed to the conceptualization, editing, reviewing, and validation of the final manuscript.

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